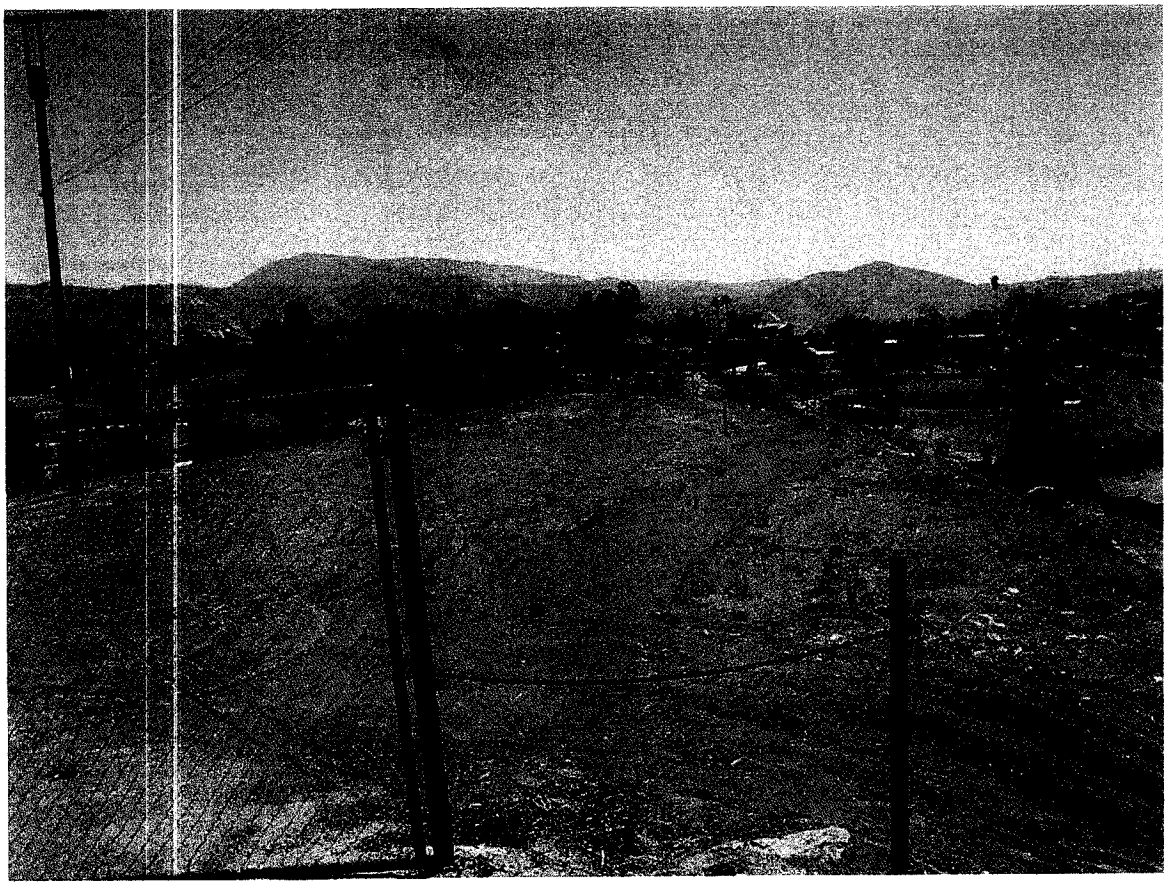

Fire Protection Plan/Fuel Modification Plan

For TPM 21112/APN 239-360-08

Redding Project/Puebla Street

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Prepared For the north County Fire Protection District

October 30, 2008

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EXECUTIVE SUMMARY

The proposed project is a Tentative Map (TPM 21112) that would divide an 11 acre parcel into 3 parcels. The proposed parcel sizes are 2.07 acres to 4.02 acres. The project is located at the intersection of Mary Lane and Puebla Street located southeast of the City of Escondido. The project encompasses moderate to steep slope land covered with non-native grasses and Southern Willow Scrub. The surrounding property is urban developed with some non-native grasses and groves. Removal of the vegetation for this project will be a marked improvement. It will substantially reduce the fire hazard in the area. The nearest fire protection for this project is Escondido Fire Station # 4 and is less than 3 minutes away. This project will access Mary Lane from Puebla Street. This Fire Protection Plan is in response to a request from the County of San Diego and the City of Escondido Fire Department.

Chapter 1 INTRODUCTION

This Fire Protection Plan/Fuel Modification Plan (FMP) has been prepared for the Redding TPM, a 3 lot residential development. The purpose of the FPP is to assess the potential impacts resulting from wildland fire hazards and identify the measures necessary to adequately mitigate those impacts. As part of the assessment, the plan has considered the property location, topography, geology, combustible vegetation (fuel types), climatic conditions, and fire history. The plan addresses water supply, access (including secondary/emergency access where applicable), structural ignitability and fire resistive building features, fire protection systems and equipment, impacts to existing emergency services, defensible space and vegetation management. The plan identifies and prioritizes areas for hazardous fuel reduction treatments and recommends the types and methods of treatment that will protect one or at-risk communities and essential infrastructures. The plan recommends measures that property owners will take to reduce the probability of ignition of structures throughout the area addressed by the plan. This plan has been developed to protect the residential structures from potential radiant heat from wildfire hazards to the maximum extent practical. This plan does not guarantee that the structure will not burn, but greatly reduces that possibility. These are not shelter in place residences. A multitude of factors have been incorporated into the Fuel Modification Plan including wildfire history, prevailing wind patterns, existing vegetation /fuel loading, terrain, adjacent vegetation/land use.

1.1 Project Location, Description and Environmental Setting

1.1.1 Project Location

This project is located near the City of Escondido and is in the Escondido Fire protection response area for Rincon Del Diablo Water District. The project is located at the intersection of Mary Lane and Puebla Street.

1.1.2 Project Description

This project is within the City of Escondido Fire Department emergency response area for Rincon Del Diablo Municipal Water District. The project consists of approximately 17.11 acres. The Tentative Parcel Map # is TPM 21112. The APN# is 239-360-08 the number of lots will be 3. The proposed potential use of the new parcels will be residential. The types of occupancies are single-family residences, the size of the structures have not been determined at this time. There will be no off site improvement to roads, the roads leading to the property are paved and in good condition.

1.1.3 Environmental Setting

Site was visited on September 8, 2008 by Lamont Landis

Topography
The project encompasses flat land, gentle slopes with steep sloped hillside to the west and east on the project. The elevations onsite range from approximately 500 feet to 625 feet above sea level.

Vegetation types are mostly non-native grasses with some Willow Scrub. Fuel loads on the property is covered with non native dry climate grasses approximately one foot in height with some trees. The fuel load for this type of fuel will be approximately .74 tons per acre (RMRS-GTR-153 USDA Forest Service).

On October 21, 2007 the Witch Fire burned over 197,990 acres of natural open space and destroyed 1,125 residential structures and 509 outbuildings. Seventy-seven structures and 25 outbuildings were damaged. The fire burned from Witch Creek near Lake Henshaw to Rancho Santa Fe near the coast. The lack of proper clearing and blowing embers from 55 mile per hour Santa Ana winds caused structures to be destroyed. The Witch Fire was driven by Santa Ana winds fueled by 50-year-old brush and an extended drought.

The following scenarios are typical of the area and are to be considered worst case assumptions:
Summer

South, Southwest, Northwest and West wind condition can result in the following fuel moistures.

1-hour fuel moisture.....4%
10-hour fuel moisture.....6%
100-hour fuel moisture.....8%
Live woody fuel moisture.....80%

Fall
South, Southwest, Northwest and West wind condition can result in the following fuel moistures.

1-hour fuel moisture..... 2%
10-hour fuel moisture.....3%
100-hour fuel moisture.....5%
Live woody fuel moisture.....50%

Santa Ana Wind Condition two to four times a year.

1-hour fuel moisture 2%
10-hour fuel moisture.....3%
100- hour fuel moisture.....5%
Live woody fuel moisture.....50%

The ownership of the area is private with onsite vegetation that consists of non-native dry climate grasses, some groves and urban developed (Not Modeled). Most of the site is urban developed with non-native grasses. The surrounding property is mostly urban developed with groves, some non-native grassland and some riparian forest.

Chapter 2 GUIDELINES FOR THE DETERMINATION OF SIGNIFICANCE

The project is located next to some wildland area with groves and urban developed lands; however the new structures will be separated from the native vegetation by more than 100 feet of modified fuel selected from the county acceptable plant list. The project has paved roads through developed land to adequately egress the site. The access road to the farthest pad is 1,000 feet from a point of egress in two directions and meets the San Diego County threshold of 1,320 feet for parcels over 1 acre and less than 5 acres. The new and existing roads and driveways will support fire apparatus for access. The project will result in adequate emergency access. The project will not adversely affect the fire district by the addition of three structures. The water supply with existing and additional

fire hydrants will serve the project and meet the requirement of the Escondido Fire Department and the County of San Diego.

Chapter 3 ANTICIPATED FIRE BEHAVIORS IN THE VICINITY

The anticipated fire behavior onsite is not expected to be significant. Flames in the unmodified non-native grasses will be approximately 12.7 feet in height. The proper clearance of 30 feet next to the road sides should allow for egress in the event of a fire (non-native grasses with 12.7 ft max flame length). The off site urban developed property and the groves should permit egress all the way to Mary Lane. The off site native vegetation to the east and south could produce flames up to 23 feet in height, this based on Behaveplus Fuel 10 timber litter with under-story [10]. The new structure will be 100 feet from this vegetation and mitigated by enhanced wildland urban interface construction as per Chapter 7A of the San Diego County Building Code. The Project will meet the requirements of the California Fire Code, California Code of Regulations Title 14, County Fire Code and the County Consolidated Fire Code.

Chapter 4 ANALYSIS OF PROJECT EFFECTS

The development of this area will reduce the spread of a wildfire by reducing the fuel loading, the addition of water supply (additional fire hydrants for fire fighting); improving of roads in the project and the clearing of home sites will provide additional fuel breaks in the area. This will be a major infield that will buffer and slow down a fire in the area. The Redding development will fall within the guidelines of the San Diego County General Plan for emergency response time objectives.

4.1 Adequate Emergency Services

Initial Fire Department response is from Escondido Fire Station No. 4 which is located at 3301 Bear Valley Parkway; this station is staffed by 3 firefighters. Apparatus include one type one engine and one-type three engine. The station is located less than .8 miles from the above property and is less than 3 minutes away by using the estimated timetable in NFPA 1142.

4.2 Fire Access

The proposed fire access road is designed to allow for egress for the public and fire fighting access for the Fire Department. The fuel modification on or adjacent to the road adds to the reduction of the spread of the fire and is part of the overall Fuel Modification Plan. All roads shall have a minimum clearance of 30 feet on each side of the new road and driveway. Turnarounds on Lots 2 and 3 shall comply with Appendix B; angle of approach shall not exceed 7 Deg.(12%) The proposed access roads shall meet or exceed

all San Diego County DPLU and Escondido Fire Department requirements. All roads and driveways shall be all-weather surface suitable for travel by a 75,000 lb. fire apparatus. All driveways or roads that exceed 15% of grade will be Portland cement concrete with deep broom finish perpendicular to the direction of travel to enhance traction; no grade will exceed 20% of grade.

Egress from the project will comply with County standards. All roads are less than 1,320 feet which meets the requirement for more than 1 acre but less than 4.99 acres and does not require second access.

4.3 Water
4.3.1 Public Water

The water supply for this proposed project will come from existing and proposed water mains from the City of Escondido Water. Domestic and fire flow systems will be designed to San Diego County Fire Code requirements adopted January 30, 2008 (2500 GPM @ 20 PSI residual), for placement see attached map.

4.4 Ignition Resistant Construction and Fire Protection Systems

All new structures shall be equipped with the following interface features:

1. Roofs will be a Class "A" noncombustible material and shall meet the DPLU standards.
2. Eaves will be of noncombustible material and boxed.
3. Exterior walls will be a noncombustible or ignition resistive material and meet the San Diego County Building Code Chapter 7A.
4. All habitable structures and attached garages will be equipped with automatic fire sprinklers per the County Consolidated Fire Code requirements (NFPA-13D). All sprinkler systems shall be approved by the Fire Department prior to installation
5. All future outbuildings must be approved by the Escondido Fire Department prior to installation.
6. All structures will comply with the wildland area structural requirements of the County Building Code Chapter 7A in affect at the time of a building permit application.

4.5 Fire Fuel Assessment

The site has the potential to experience a vegetation fire. This is based on the type of vegetation and its continuous nature, Santa Ana winds, high temperatures, low humidity and drought conditions. The primary fuel covering the site is non-native grasses fuel model 1 short grasses (S) that generally have a maximum of .74 tons per acre fuel load with a maximum flame length of 12.7 feet. There are some trees on the site that could

produce some litter however they are not in position to create a hazard to the structures. There is some Diegan Coastal Sage Scrub off site to the south and west, however it is more than 100 feet from the structures and should not be a threat.

4.6 Fire Behavior Modeling

BehavePlus Wildfire Modeling

The BehavePlus Fire Modeling System (Version 4.0.0) developed by the U.S. Forest Service Rocky Mountain Research Station is the generally accepted software for modeling large-scale wildfire behavior and characteristics. The BehavePlus system was designed to evaluate a variety of wildfire variables for large wildland fires including surface fire spread, safety zones, fire containment, spotting distance crown scorch and probability of ignition. Two aspects of this program (surface fire spread and safety zone) have been utilized to assist in determining acceptable fuel modification requirements. The BehavePlus program, coupled with onsite and surrounding area vegetation, access, slope and weather conditions are the basis for the following.

The BehavePlus Fire System has been run for the following worst case scenarios:

60 MPH wind 100-degree ambient air temperature, 2 % dead fuel moisture, 50 % live fuel moisture and 50% max slope with 25 % average slope aspect. The model was run for four fuel model scenarios, as the project contains varying types of fuels.

It should be noted that the BehavePlus Model does not and cannot include all variables associated with a specific site and regime, and adjacent mixed land uses can influence the results.

The BehavePlus Model run results are summarized in Table 1.

Table 1

4.1 BehavePlus Fire Model

Fuel Model 1 [Short Grass (s)]

Wind Speed & Direction	Mid-flame	Rate of Spread	Fire Line Intensity	Flame Length
60 mph N, NE, E	24.0 mph	665.6 Ch/h	1415 Btu/ft/s	12.7 FT.

Up-slope spotting distance= 1.1 miles

Fuel Model 10 Timber with Litter Understory(S)

Wind Speed & Direction	Mid-flame	Rate of Spread	Fire Line Intensity	Flame Length
60 mph N,NE,E	24.0 mph	145.9 Ch/h	4385 Btu/ft/s	21.3 ft

Up-slope spotting distance= 1.6 miles

The Behave Plus coupled with the expected offshore Santa Ana wind direction, anticipated down slope fire line aspect, and relatively low fuel vegetation within the urban wildland interface areas, and existing fuel modified areas serves as a basis for formulation of the recommended fuel modification zone locations.

4.7 Defensible Space and Vegetation Management

Fuel Management Zones:

All Parcels

As proposed on TPM 21112 the conceptual residential structures from the structure to a point 50 feet in all directions shall be maintained as Zone 1 and from a point 50 feet from the structure to 100 feet shall be maintained as Zone 2. Zones 1 and 2 shall be clearly and permanently marked for annual maintenance. All distances are on a horizontal plain regardless of the slope.

Note: All Fuel Modification Zones must be delineated with permanent markers until such times as they are no longer needed as determined by the Fire Marshal. The most reliable markers are metal fence posts with a baked on painted finish, (day glow orange on the top half).

Fuel Management Zone 1:

Zone 1 is the first 50 feet or as otherwise indicated on the TPM 21112. This is an area where native vegetation has been removed, irrigated and planted with drought-tolerant and fire resistant plant material. Plant selection shall be from Appendix A.

The purpose of Zone 1 (set back zone) is to provide a defensible space for fire suppression forces to protect structures from radiant and convective heat. The following shall be part of fuel management of this zone:

1. No combustible construction, groves, firewood, propane tanks, fuel or combustible native or ornamental vegetation shall be allowed within the 50 foot set back Zone 1 or within 30 feet of the edge of slopes.

2. Mature trees (>18') to be limbed up or canopied 6' from ground level.
3. No tree limbs within 10' of chimney outlets or dead limbs overhanging structures.
4. Spacing between mature tree canopies must be as follows:
    A. Slopes 0-20 % ----10 Feet.
    B. Slopes 21-40 % ----20 Feet.
    C. Slopes > 41 % ----30 Feet.

The minimum horizontal space between the edges of shrubs
A. Slopes 0-20%----2 times the height of the shrub.
B. Slopes 21-40%----4 times the height of the shrub.
C. Slopes > 40%----6 times the height of the shrub.

The minimum vertical space between the top of the shrub and the bottom of the lower tree braches is 3 times the height of the shrub.

(Gilmer, M. 1994 California Wildfire Landscaping, adapted by the State Board of Forestry and Fire Protection on February 8, 2006.)

Fuel Management Zone 2

This Fuel Management Zone will be the area between 50 feet to 100 feet from the structure. The landscape plans shall include methods of erosion control to protect against slope failure. The following shall apply to Zone 2:

1. Clear 50% of the existing native combustible vegetation including all dead and dying. This area must be modified so combustible vegetation does not occupy more than 50% of the total square footage. Trees may remain provided that the horizontal distance between crowns of the adjacent trees is not less than 10 feet.
2. Orchards, groves and vineyards shall be maintained as per sec. 4707.3.2 of the San Diego County Fire Code adopted January 30, 2008.
3. Fire resistive plant materials are also required in Zone 2 to control soil erosion and/or to reduce vegetation mass near the wildland interface.
4. Plant spacing will be the same as noted for Zone 1.
5. All plants used in Zone 1 and 2 comply with the San Diego County Acceptable Plant list, Appendix A.

Landscape Requirements/Restrictions

The landscaping within the Fuel Modification Zones must be approved by the Escondido Fire Department and shall include low fuel, drought tolerant type vegetation from the list adopted by the County of San Diego (see Appendix A).

Fuel Modification Zone Maintenance Requirements

Fuel Modification Zones must be maintained in a manner that will fulfill the intent of the Fuel Modification Plan and meet the requirements of the Escondido Fire Department. Maintenance will include initial planting, weeding, irrigation installation, maintenance and plant pruning. Removal of dead and down vegetation, and the replacement of plants as required.

The following will also apply to this project:

1. Each lot owner is personally responsible for all irrigation and landscaping fuel treatment zones within their property boundaries.
2. The Escondido Fire Department will hold each lot owner within this subdivision accountable for enforcement of all wildland fire protection issues discussed in this plan.
3. Each lot owner shall not allow trash dumping or disposal of any yard trimmings in the Fuel Treatment Zones.
4. The Escondido Fire Department or its designated representative shall decide any disputes related to individual lot landscaping or fuel treatment, with respect to interpretation of the Fire Protection Plan. Decisions shall be final and binding on the lot owner.
5. Should modifications to the Tentative Map Plans occur, any and/or all of the Fire Protection Plan may be revised at the discretion of the Escondido Fire Department. All exterior boundaries of Zones 1 and 2 shall be permanently marked on the ground for purposes of guiding annual fuel management maintenance and inspection operations. The most reliable markers are steel fence post with baked on painted finish. The upper half of the above ground portion of the fence post is then painted a bright "day glow" orange to improve visibility. These Fuel Treatment Zone markers must be spaced so that the markers on each side of an installed marker can be seen from that marker.

4.8 Cumulative Impact Analysis

This and other projects may have a cumulative impact on the ability to protect residences from wildfires. Over time with this project and other development in the area, the population in rural areas will increase which may increase the chances of a wildfire and increase the number of people and structures exposed to the risk of loss, injury or death.

Property taxes and other currently applicable fees generated by the project may not adequately fund fire services. This project and others in the area are required to participate in the Community Facility District established by the Rincon Del Diablo Water District. This participation will help maintain a quality level of service.

Chapter 5 MITIGATION MEASURES AND DESIGN CONSIDERATIONS

The fuel modification of 100 feet will reduce the threat to the structure from the vegetation onsite. The structure will be designed with enhanced fire resistive construction as per the County Building Code Chapter 7. The driveways will have 30 feet of clearing (fuel modification) on both sides.

Chapter 6 CONCLUSION

The development of this area will reduce the spread of a wildfire by reducing the fuel loading, the addition of water supply (additional hydrant for fire fighting @ 2500 gallons per minute at 20 psi residual); improving of roads in the project and the clearing of home sites will provide additional fuel breaks in the area. A two tiered Fuel Modification Zone system is proposed to create an adequate fire safety buffer along the proposed development areas and access roads, which would be defensible space in case of a wildfire. The Fuel Modification Zone recommendations are based upon a combination of BehavePlus modeling data, onsite vegetation, access, surrounding area fuel conditions, slope and worst-case weather conditions. The Fuel Modification Zones have been designed to meet the requirements of Escondido Fire Department and San Diego County DPLU. The proposed mitigation will reduce the significance to a "less than significant" status in accordance with guidelines.

Chapter 7 LIST OF PREPARERS AND PERSONS AND ORGINAZTIONS CONTACTED

Ralph Gonzales at Wynn Engineering
Lamont Landis Principal Author (is on the San Diego County list of approved consultants)

Chapter 8 REFERANCES

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10. Aids for Determining Fuel Models for Estimating Fire Behavior. By Hal E Anderson USDA Forest Service General Technical Report INT-122
11. General Guidelines for Creating Defensible Space Adopted by The State Board of Forestry and Fire Protection on February 8, 2008

Appendix A

San Diego County

Invasive Plat List

Undesirable Plan List

Acceptable Plants for a Defensible Space In Fire Prone Areas

SUGGESTED PLANT LIST FOR A DEFENSIBLE SPACE

BOTANICAL NAME	COMMON NAME	Climate Zone
TREES		
Acer		
platanoides	Norway Maple	M
rubrum	Red Maple	M
saccharinum	Silver Maple	M
saccarum	Sugar Maple	M
macrophyllum	Big Leaf Maple	C/ (R)
Alnus rhombifolia	White Alder	C/I/M (R)
Arbutus		
unedo	Strawberry Tree	All zones
Archontophoenix		
cunninghamiana	King Palm	C
Arctostaphylos spp.**	Manzanita	C/I/D
Brahea		
armata	Blue Hesper Palm	C/D
edulis	*Guadalupe Palm*	*C/D*
Ceratonia siliqua	Carob	C/I/D
Cerdidium floridum	Blue Palo Verde	D
Cercis occidentalis**	Western Redbud	C/I/M
Cornus		
nuttallii	*Mountain Dogwood*	I/M
stolonifera	Redtwig Dogwood	I/M
Eriobotrya		C/I/D
japonica	Loquat	C
Erythrina caffra	Kaffirboom Coral Tree	I/M
Gingko biloba "Fairmount"	Fairmount Maidenhair Tree	I/D/M
Gleditisia triacanthos	Honey Locust	
Juglans		I
californica	California Walnut	C/I
hindsii	California Black Walnut	I/D/M
Lagerstroemia indica	Crape Myrtle	I
Ligustrum lucidum	*Glossy Privet*	C/I/M
Liquidambar styraciflua	Sweet Gum	I
Liriodendron tulipifera	Tulip Tree	
Lyonothamnus floribundus		C
ssp. Asplenifolius	Fernleaf Catalina Ironwood	C/I/D
Melaleuca spp.	Melaleuca	C/I
Parkinsonia aculeate	Mexican Palo Verde	
Pistacia	Chinese Pistache	
chinensis	Pistachio Nut	C/I/D

vera	Pistachio Nut	I
Pittosporum		
phillyraeoides	Willow Pittosporum	C/I/D
viridiflorum	Cape Pittosporum	C/I
Platanus		
acerifolia	London Plane Tree	All zones
racemosa**	California Sycamore	C/I/M
Populus		
alba	White Poplar	D/M
fremontii**	Western Cottonwood	I
trichocarpa	Black Cottonwood	I/M
Prunus		
xblireiana	Flowering Plum	M
caroliniana	Carolina Laurel Cherry	C
ilicifolia**	Hollyleaf Cherry	C
lyonii**	Catalina Cherry	C
serrulata 'Kwanzan'	Flowering Cherry	M
yedoensis 'Akebono'	Akebono Flowering Cherry	M
Quercus		
agrifolia**	Coast Live Oak	C/I
engelmannii	Engelmann Oak	I
** suber	Cork Oak	C/I/D
Rhus		
lancea**	African Sumac	C/I/D
Salix spp.**	Willow	All zones (R)
Tristania conferta	Brisbane Box	C/I
Ulmus		
parvifolia	Chinese Elm	I/D
pumila	Siberian Elm	C/M
Umbellularia californica**	California Bay Laurel	C/I

SHRUBS

Agave	Century Plant	D
americana	Century Plant	D
deserti	Shawis Century Plant	D
shawi**		
Amorpha fruticosa**	False Indigobush	I
Arbutus		
menziesii**	Madrone	C/I
Arctostaphylos spp.**	Manzanita	C/I/D
Atriplex**		
canescens	Hoary Saltbush	I
lentiformis	Quail Saltbush	D
Baccharis**		
glutinosa	Mule Fat	C/I
pilularis	Coyote Bush	C/I/D
Carissa grandiflora	Natal Plum	C/I
Ceanothus spp.**	California Lilac	C/I/M
Cistus spp.	Rockrose	C/I/D
*Cneoridium dumosum***	*Bushrue*	C
Comarostaphylis**		
diversifolia	Summer Holly	C
Convolvulus cneorum	Bush Morning Glory	C/I/M
Dalea		
orcuttii	Orcutt's Delea	D
spinosa**	Smoke Tree	I/D
Elaeagnus		
pungens	Silverberry	C/I/M
Encelia**		
californica	Coast Sunflower	C/I
farinose	White Brittlebush	D/I
Eriobotrya		
deflexa	Bronze Loquat	C/I
Eriophyllum		
confertiflorum**	Golden Yarrow	C/I
staechadifolium	Lizard Tail	C
Escallonia spp.	Escallonia	C/I
Feijoa sellowiana	Pineapple Guava	C/I/D
Fouqueria splendens	Ocotillo	D
Fremontodendron**		
californicum	Flannelbush	I/M
mexicanum	Southern Flannelbush	I
Galvezia		
juncea	Baja Bush-Snapdragon	C
speciosa	Island Bush-Snapdragon	C
Garrya		
elliptica	Coast Silktassel	C/I
flavescens**	Ashy Silktassel	I/M

Heteromeles arbutifolia**	Ashy Silktassel	I/M
Lantana spp.	Toyon	C/I/M
Lotus scoparius	Lantana	C/I/D
Mahonia spp.	Deerweed	C/I
	Barberry	C/I/M
Malacothamnus		
clementinus	San Clemente Island Bush Mallow	C
fasciculatus**	Mesa Bushmallow	C/I
Melaleuca spp.	Melaleuca	C/I/D
Mimulus spp.**	Monkeyflower	C/I (R)
Nolina		
parryi	Parry's Nolina	I
parryi ssp. wolfii	Wolf's Bear Grass	D
Photinia spp.	Photinia	All Zones
Pittosporum		
crassifolium		C\/I
rhombifolium	Queensland Pittosporum	C/I
tobira 'Wheeleri'	Wheeler's Dwarf	C/I/D
undulatum	Victorian Box	C/I
viridiflorum	Cape Pittosporum	C/I
Plumbago auriculata	Cape Plumbago	C/I/D
Prunus		
caroliniana	Carolina Laurel Cherry	C
ilicifolia**	Hollyleaf Cherry	C
lyonii**	Catalina Cherry	C
Puncia granatum	Pomegranate	C/I/D
Pyracantha spp.	Firethorn	All Zones
Quercus		
dumosa**	Scrub Oak	C/I
Rhamus		
alaternus	Italian Blackthorn	C/I
californica**	Coffeeberry	C/I/M
Rhaphiolepis spp.	Rhaphiolepis	C/I/D
Rhus		
integrifolia**	Lemonade Berry	C/I
laurina	Laurel Sumac	C/I
lentii	Pink-Flowering Sumac	C/D
ovata**	Sugarbush	I/M
trilobata**	squawbush	I
Ribes		
viburnifolium	Evergreen Currant	C/I
speciosum**	Fuschia-Flowering Gooseberry	C/I/D
Romneya coulteri	Matilija Poppy	I
Rosa		
californica**		
minutifolia		

Salvia spp.**	California Wild Rose	C/I
Sambucus spp.**	Baja California Wild Rose	C/I
Symphoricarpos mollis**	Sage	All Zones
Syringa vulgaris	Elderberry	C/I/M
Tecomaria capensis	Creeping Snowberry	C/I
Teucrium fruticans	Lilac	M
Toxicodendron**	Cape Honeysuckle	C/I/D
diversilobum	Bush Germander	C/I
Verbena		
lilacina	Poison Oak	I/M
Xylosma congestum		
Yucca**	Lilac Verbena	C
schidigera	Shiny Xylosma	C/I
whipplei		
	Mojave Yucca	D
	Foothill Yucca	I

GROUNDCOVERS

Achillea**	Yarrow	All Zones
Aptenia cordifolia	Apteria	C
Arctostaphylos spp.**	Manzanita	C/I/D
Baccharis**		
pilularis	Coyote Bush	C/I/D
Ceanothus spp.**	California Lilac	C/I/M
Cerastium tomentosum	Snow-in-Summer	All Zones
Coprosma kirkii	Creeping Coprosma	C/I/D
Cotoneaster spp.	Redberry	All Zones
Drosanthemum hispidum	Rosea Ice Plant	C/I
Dudleya		
brittonii	Brittonis Chalk Dudleya	C
pulverulenta**	Chalk Dudleya	C/I
virens	Island Live Fore-ever	C
Eschscholzia californica**	California Poppy	All Zones
Euonymus fortunei		
'Carrierei'	Glossy Winter Creeper	M
'Coloratus'	Purple-Leaf Winter Creeper	M
Ferocactus viridescens**	Coast Barrel Cactus	C
Gaillardia grandiflora	Blanket Flower	All Zones
Gazania spp.	Gazania	C/I
Helianthemum spp.**	Sunrose	All Zones
Lantana spp.	Lantana	C/I/D
Lasthenia		
californica**	Common Goldfields	I
glabrata	Coastal Goldfields	C
*Lupinus spp.***	Lupine	C/I/M
Myoporum spp.	Myoporum	C/I
Pyracantha spp.	Firethorn	All zones
Rosmarinus officinalis	Rosemary	C/I/D
Santolina		
chamaecyparissus	Lavender Cotton	All Zones
virens	Santolina	All Zones
Trifolium frageriferum	O'Connor's Legume	C/I
Verbena		
rigida	Verbena	All Zones
Viguiera laciniata**	San Diego Sunflower	C/I
Vinca		
minor	Dwarf Periwinkle	M

VINES

Antigonon leptopus	San Miguel Coral Vine	C/I
Distictis buccinatoria	*Blood-Red Trumpet Vine*	C/I/D
Keckiella cordifolia**	Heart-Leaved Penstemon	C/I
Lonicera		
japonica 'Halliana'	Hall's Honeysuckle	All Zones
subspicata**	Chaparral Honeysuckle	C/I
Solanum		
jasminoides	Potato Vine	C/I/D

PERENNIALS

Coreopsis		
gigantean	*Giant Coreopsis*	C
grandiflora	Coreopsis	All Zones
maritime	Sea Dahlia	C
verticillata	Coreopsis	C/I
Heuchera maxima	Island Coral Bells	C/I
Iris douglasiana**	Douglas Iris	C/M
Iva hayesiana**	Poverty Weed	C/I
Kniphofia uvaria	Red-Hot Poker	C/M
Lavandula spp.	Lavender	All Zones
Limonium californicum		
var. mexicanum	Coastal Statice	C
perezii	Sea Lavender	C/I
Oenothera spp.	Primrose	C/I/M
Penstemon spp.**	Penstemon	C/I/D
Satureja douglasii	Yerba Buena	C/I
Sisyrinchium		
bellum	Blue-Eyed Grass	C/I
californicum	Golden-Eyed Grass	C
Solanum		
xantii	Purple Nightshade	C/I
Zauschneria**		
californica	California Fuschia	C/I
cana	Hoary California Fuschia	C/I
'Catalina'	Catalina Fuschia	C/I

ANNUALS

Lupinus spp.**	Lupine	C/I/M

UNDESIRABLE PLANT LIST

The following species are highly flammable and should be avoided when planting within the first 50 feet adjacent to a structure. The plants listed below are more susceptible to burning, due to rough or peeling bark, production of large amounts of litter, vegetation that contains oils, resin, wax, or pitch, large amounts of dead material in the plant, or plantings with a high dead to live fuel ratio. Many of these species, if existing on the property and adequately maintained (pruning, thinning, irrigation, litter removal, and weeding), may remain as long as the potential for spreading a fire has been reduced or eliminated.

BOTANICAL NAME	COMMON NAME
Abies species	Fir Trees
Acacia species	Acacia (trees, shrubs, groundcovers)
*Adenostoma sparsifolium***	Red Shanks
*Adenostoma fasciculatum***	Chamise
Agonis juniperina	Juniper Myrtle
Araucaria species	Monkey Puzzle, Norfolk Island Pine
*Artemesia californica***	California Sagebrush
Bambusa species	Bamboo
Cedrus species	Cedar
Chamaecyparis species	False Cypress
Coprosma pumila	Prostrate Coprosma
Cryptomeria japonica	Japanese Cryptomeria
Cupressocyparis leylandii	Leylandii Cypress
*Cupressus forbesii***	Tecate Cypress
Cupressus glabra	Arizona Cypress
Cupressus sempervirens	Italian Cypress
Dodonea viscosa	Hopseed Bush
*Eriogonum fasciculatum***	Common Buckwheat
Eucalyptus species	Eucalyptus
*Heterotheca grandiflora***	Telegraph Plant
Juniperus species	Junipers
Larix species	Larch
Lonicera japonica	Japanese Honeysuckle
Miscanthus species	Eulalia Grass
*Muehlenbergia species***	Deer Grass
Palmae species	Palms
Picea species	Spruce Trees
*Pickeringia Montana***	Chaparral Pea
Pinus species	Pines
Podocarpus species	Fern Pine
Pseudotsuga menziesii	Douglas Fir
Rosmarinus species	Rosemary
*Salvia mellifera***	Black Sage
Taxodium species	Cypress
Taxus species	Yew
Thuja species	Arborvitae
Tsuga species	Hemlock
*Urtica urens***	Burning Nettle

** San Diego County native species

References: Gordon, H. White, T.C. 1994. *Ecological Guide to Southern California Chaparral Plant Series.* Cleveland National Forest.

Willis, E. 1997. San Diego County Fire Chief's Association. Wildland/Urban Interface Development Standards

City of Oceanside, California. 1995. Vegetation Management. Landscape Development Manual. Community Services Department, Engineering Division.

City of Vista, California 1997. Undesirable Plants. Section 18.56.999. Landscaping Design, Development and Maintenance Standards.

www.bewaterwise.com. 2004. Fire-resistant California Friendly Plants.

www.ucfpl ucop.edu. 2004. University of California, Berkeley, Forest Products Laboratory, College of Natural Resources. Defensible Space Landscaping in the Urban/Wildland Interface. A Compilation of Fire Performance Ratings of Residential Landscape Plants.

County of Los Angeles Fire Department. 1998. Fuel Modification Plan Guidelines. Appendix I, Undesirable Plant List, and Appendix II, Undesirable Plant List.

INVASIVE PLANT LIST

The following species are considered invasive (i.e., those capable of reproducing and spreading into native, non-irrigated areas and displacing those communities). Non-native plant species are prohibited in all areas adjacent to open space lands. Noxious weeds that have been introduced to San Diego County over the years tend to be more widespread and therefore more difficult to contain. The plants listed below have been identified as invasive and/or as noxious weeds and should not be planted or allowed to sprout in any transitional landscapes (landscapes planted with non-native species next to undeveloped areas).

BOTANICAL NAME	COMMON NAME
Ailanthus altissima	Tree of Heaven
*Anthemis cotula****	Mayweed, Stinking Chamolile
Arctotheca calendola	Cape Weed
Arundo donax	Giant Cane
Atriplex semibaccata	Australian Saltbush
*Brassica species****	Mustard
*Cardaria draba****	Hoary Cress, Perennial Peppergrass
Carpobrotus edulis	Ice Plant
Centaurea solstitialis	Yellow Starthistle
*Cirsium vulgare****	Wild Artichoke
Conium maculatum	Poison Hemlock
*Conyza Canadensis****	Horseweed
Cortaderia selloana	Pampas Grass
Cotoneaster lacteus	Cotoneaster
Cupressus macrocarpa	Monterey Cypress
*Cynara cardunculus****	Artichoke Thistle
Cytisus species	Scotch Broom, French Broom, etc
Elaeagnus angustifolia	Russian Olive
Eucalyptus globulus	Eucalyptus Blue Gum
*Gensita species****	Broom
Hedera helix	English Ivy
Hypericum perforatum	St. John's Wort
Ilex aquifolium	English Holly
*Lactuca serriola****	Prickly Lettuce
Lepidium latifolium	Perennial Pepperweed
Myoporum parvifolium	Trailing Myoporum
Nerium oleander	Oleander
Nicotiana species	Tree Tobacco
Olea europaea	Olive
Pennisetum setaceum	Fountain Grass
Ricinus communis	Castor Bean
Robinia pseudoacacia	Black Locust
*Salsola australis****	Russian Thistle, Tumbleweed
Schinus molle	California Pepper
Schinus terebinthifolius	Brazilian Pepper
*Silybum marianum****	Milk Thistle
Spartium junceum	Spanish Broom

Tamarix species	Tamarisk
*Ulex europea****	Gorse
Vinca major	Periwinkle

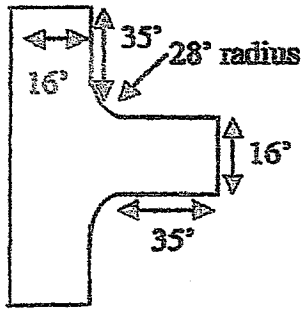
*** Introduced Weeds to San Diego County

References: Bell, Carl, Regional Advisor – Invasive Plants. 2004. University of California Cooperative Extension.

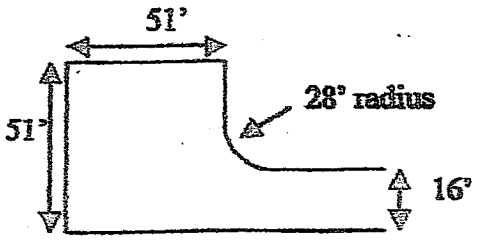
California Exotic Pest Plant Council. October, 1999. Exotic Pest Plants of Greatest Ecological Concern in California. Most Invasive Wildland Pest Plants. www.caleppc.org/info/99lista.html.

Appendix B

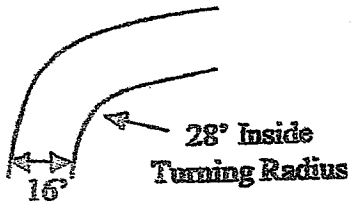
Fire Apparatus Turnaround Configurations



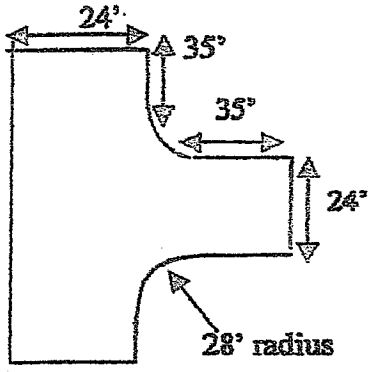
Private Driveway
Hammerhead



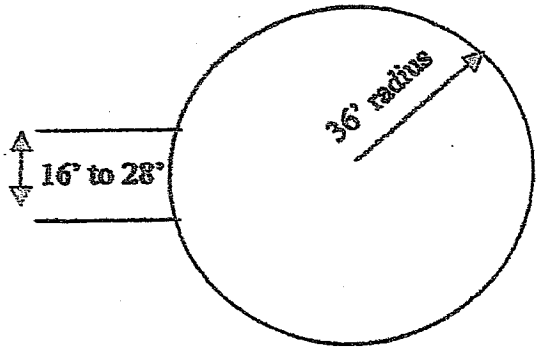
Alternate Private
Driveway Hammerhead

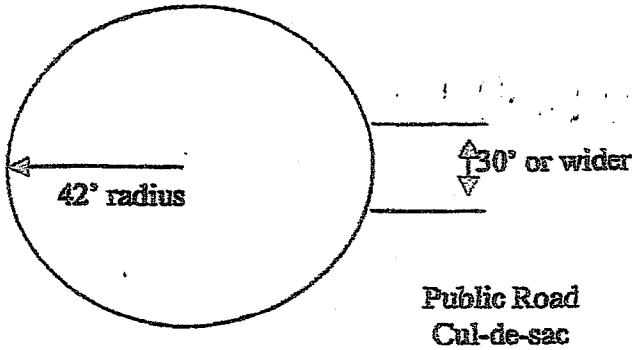


Private Road or
Driveway Cul-de-sac

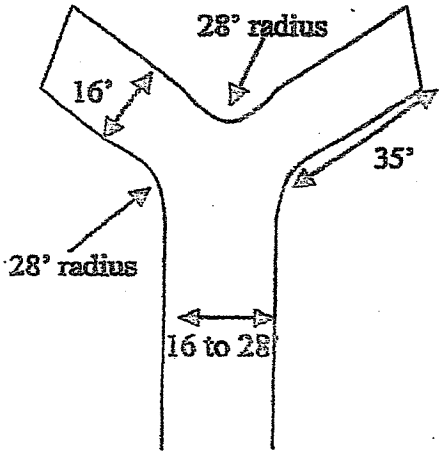


Private Road
Hammerhead

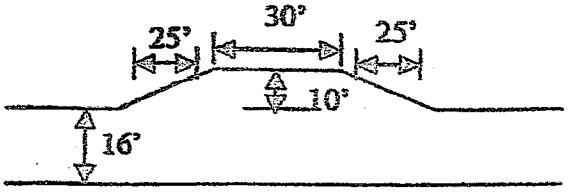




Public Road
Cul-de-sac



Hammerhead Incorporating Radius

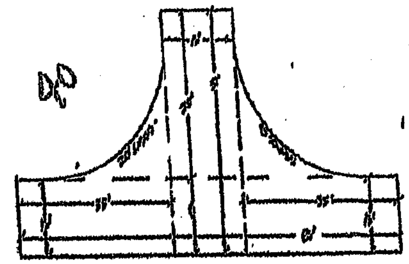


Turnout—Required for driveways
In excess of 300-400'

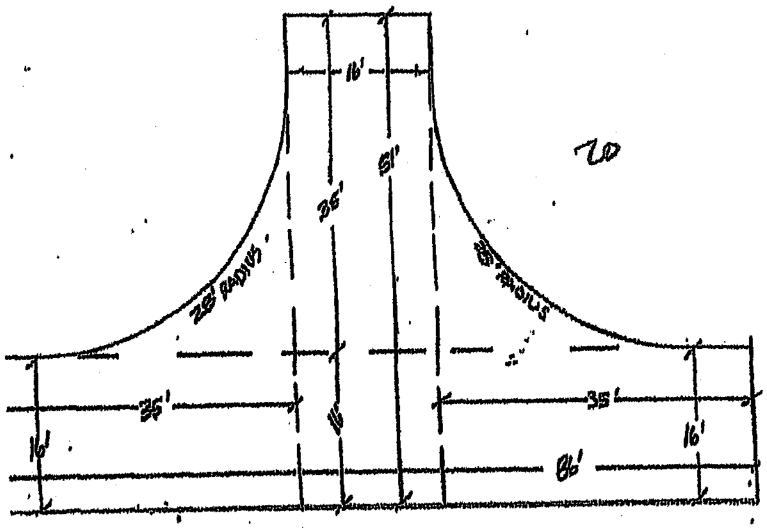
NOT TO SCALE

(OVER)

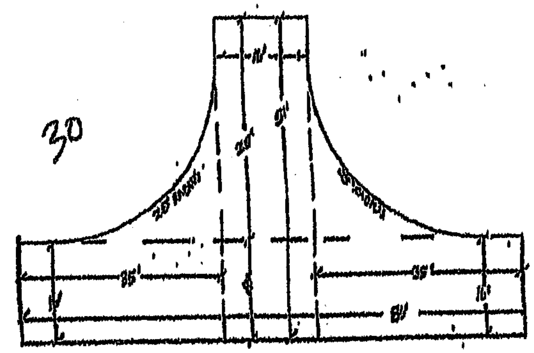
DP

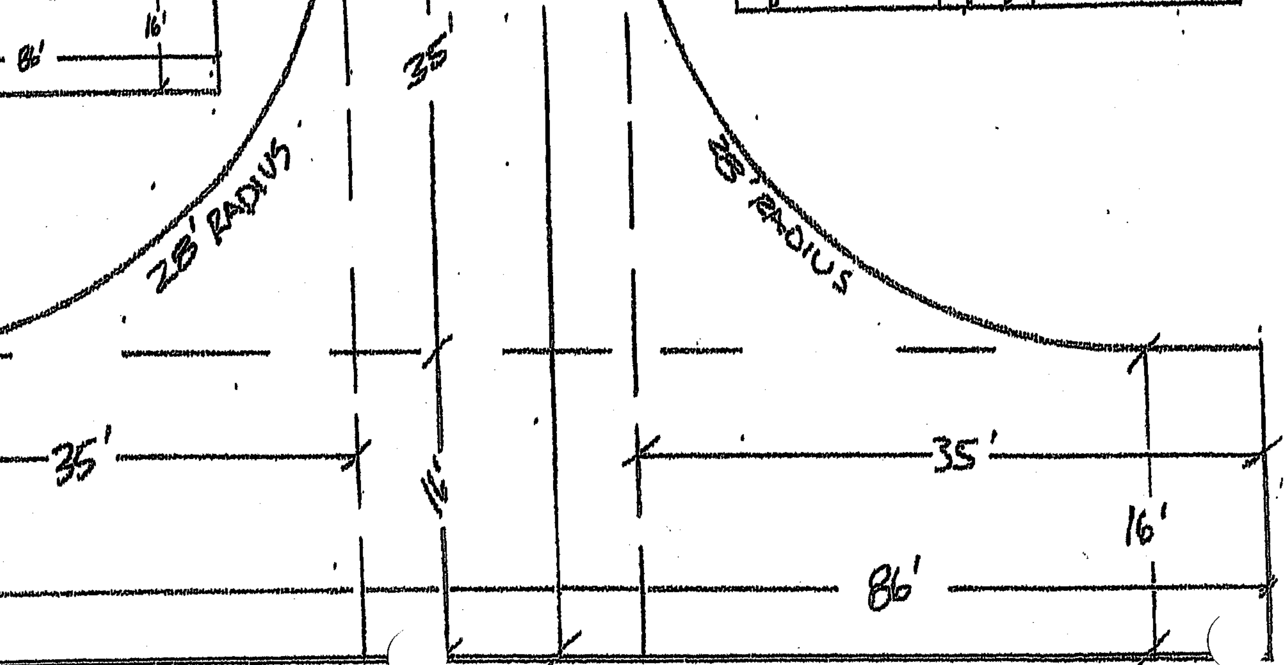

16'
35'
51'
35'
16'
86'
35'
35'
28' RADIUS
28' RADIUS

20


16'
28' RADIUS
35'
51'
28' RADIUS
35'
16'
35'
16'
86'
16'

30




16'
35'
51'
28' RADIUS
28' RADIUS
35'
16'
35'
16'
86'
16'

10

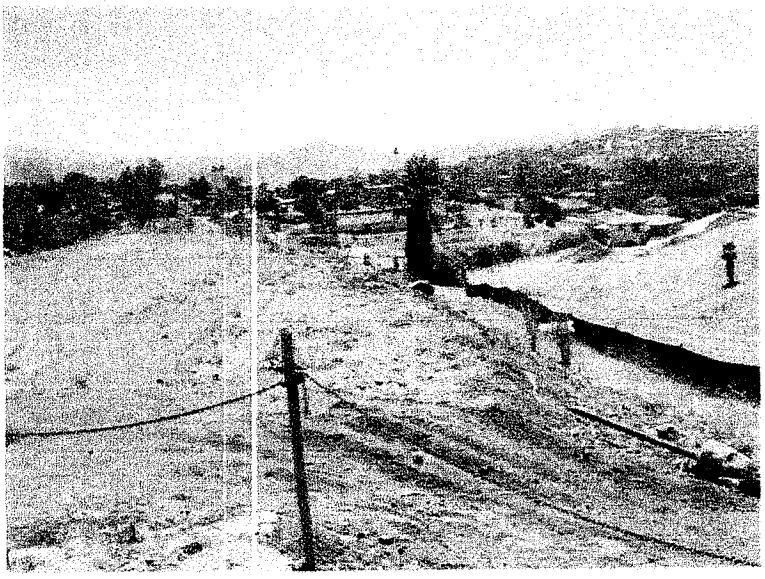
Appendix C

Photos

Existing fire hydrant at the end of the road

looking south at the west side of the project

looking south at the project



looking south across the project

looking east of the project

looking at parcel 1 to the north

Appendix D

Behaveplus 4.0.0 Fire Model

Modules: SURFACE, SPOT, IGNITE

Description		TPM 21112

Fuel/Vegetation, Surface/Understory

Fuel Model		1

Fuel/Vegetation, Overstory

Canopy Height	ft	1

Fuel Moisture

1-h Moisture	%	2
10-h Moisture	%	
100-h Moisture	%	
Live Herbaceous Moisture	%	
Live Woody Moisture	%	

Weather

20-ft Wind Speed (upslope)	mi/h	60
Wind Adjustment Factor		0.3
Air Temperature	oF	100
Fuel Shading from the Sun	%	10

Terrain

Slope Steepness	%	50
Ridge-to-Valley Elevation Difference	ft	100
Ridge-to-Valley Horizontal Distance	mi	.1
Spotting Source Location		VB

Run Option Notes

Calculations are only for the direction of maximum spread [SURFACE].

Fireline intensity, flame length, and spread distance are always for the direction of the spread calculations [SURFACE].

Wind is blowing upslope [SURFACE].

Output Variables

Surface Rate of Spread (maximum) (ch/h) [SURFACE]

Heat per Unit Area (Btu/ft2) [SURFACE]

Fireline Intensity (Btu/ft/s) [SURFACE]

Flame Length (ft) [SURFACE]

Midflame Wind Speed (upslope) (mi/h) [SURFACE]

(continued on next page)

Input Worksheet (continued)

Wind Adjustment Factor [SURFACE]

Spot Dist from Wind Driven Surface Fire (mi) [SPOT]

Probability of Ignition from a Firebrand (%) [IGNITE]

Notes

TPM 21112

Surface Rate of Spread (maximum)	665.6	ch/h
Heat per Unit Area	116	Btu/ft2
Fireline Intensity	1415	Btu/ft/s
Flame Length	12.7	ft
Midflame Wind Speed (upslope)	18.0	mi/h
Wind Adjustment Factor	0.3	
Spot Dist from Wind Driven Surface Fire	1.1	mi
Probability of Ignition from a Firebrand	100	%

Discrete Variable Codes Used
TPM 21112

Fuel Model

1	Short grass (S)

Spotting Source Location

VB	Valley Bottom

Modules: SURFACE, SPOT, IGNITE

Description		TPM 21112
Fuel/Vegetation, Surface/Understory		
Fuel Model		10
Fuel/Vegetation, Overstory		
Canopy Height	ft	1
Fuel Moisture		
1-h Moisture	%	2
10-h Moisture	%	3
100-h Moisture	%	5
Live Herbaceous Moisture	%	
Live Woody Moisture	%	60
Weather		
20-ft Wind Speed (upslope)	mi/h	60
Wind Adjustment Factor		0.5
Air Temperature	oF	100
Fuel Shading from the Sun	%	10
Terrain		
Slope Steepness	%	50
Ridge-to-Valley Elevation Difference	ft	100
Ridge-to-Valley Horizontal Distance	mi	.1
Spotting Source Location		VB

Run Option Notes

Calculations are only for the direction of maximum spread [SURFACE].

Fireline intensity, flame length, and spread distance are always for the direction of the spread calculations [SURFACE].

Wind is blowing upslope [SURFACE].

Output Variables

Surface Rate of Spread (maximum) (ch/h) [SURFACE]

Heat per Unit Area (Btu/ft2) [SURFACE]

Fireline Intensity (Btu/ft/s) [SURFACE]

Flame Length (ft) [SURFACE]

Midflame Wind Speed (upslope) (mi/h) [SURFACE]

(continued on next page)

Input Worksheet (continued)

Wind Adjustment Factor [SURFACE]

Spot Dist from Wind Driven Surface Fire (mi) [SPOT]

Probability of Ignition from a Firebrand (%) [IGNITE]

Notes

TPM 21112

Surface Rate of Spread (maximum)	180.2	ch/h
Heat per Unit Area	1617	Btu/ft2
Fireline Intensity	5342	Btu/ft/s
Flame Length	23.3	ft
Midflame Wind Speed (upslope)	30.0	mi/h
Wind Adjustment Factor	0.5	
Spot Dist from Wind Driven Surface Fire	1.7	mi
Probability of Ignition from a Firebrand	100	%

Discrete Variable Codes Used
TPM 21112

Fuel Model

10	Timber with litter & understory (S)

Spotting Source Location

VB	Valley Bottom

Appendix E

Project Facility Availability Fire

Appendix F

Project Facility Availability Water

Appendix G

Aerial Photos

Google Maps

Address

Google Maps

Address

Appendix H

Vegetation Map